

### **REMARKS**

This is intended as a full and complete response to the Office Action dated June 23, 2004, having a shortened statutory period for response set to expire on September 23, 2004. Please reconsider claims 1-20 now pending in the application for reasons discussed below.

Applicants have amended claim 11 to remove a typographical error of the repeated phrase "one of the". This amendment has not been made to overcome any cited references, suggested prior art or for any reasons relating to patentability but rather to remove redundant language erroneously included in claim 11.

### **I. OBJECTIONS**

The Examiner has objected to the drawings. Specifically, the Examiner states that "Figures 1-3 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated." Applicants traverse this objection.

Applicants submit that Figures 1-3 do not illustrate a communication system or related aspects where "only that which is old is illustrated." In fact, as disclosed in the BRIEF DESCRIPTION OF THE DRAWINGS, the DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS, and significantly as stated by the Examiner, Applicants do not describe these aspects of the present invention as "prior art" but rather as "an exemplary communication system;" "an exemplary communication channel model;" and "an exemplary communication signal".

"Exemplary" does not mean "prior art." Rather, Figures 1-3 illustrate example embodiments used in connection with the present invention. For example, Figure 1 depicts a high level block diagram of a communication system benefited from an aspect of the present invention. Specifically, the receiver 150 depicted in Figure 1 is a high level illustration of a receiver in accordance with an embodiment of the present invention as described in, for example, Figure 4. Equally, Figure 2 illustrates an example of model of a communication channel 200 used in connection with an embodiment of the present invention. Likewise, Figure 3 illustrates an example of a

signal 300 used in connection with an embodiment of the present invention. Accordingly, Applicants respectfully request the objections to Figures 1-3 be withdrawn.

Although not objected to, Fig. 4 has been amended to correct a typographical error regarding the first instance of Ref. No. "480". Applicants have corrected this Ref. No. "480" to read --475--, which is supported by the specification on page 7, line 22.

## **II. REJECTION OF CLAIMS 1-20 UNDER 35 U.S.C. § 103(a)**

### **A. Claims 1-20**

In paragraph 4 of the Office Action, the Examiner has rejected claims 1-20 under 35 U.S.C. § 103 as being unpatentable over the alleged "admitted prior art" in view of the IEEE article, authored by Ariyavisitakul and entitled, "Equalization of a Hard-Limited Slowly-Fading Multipath Signal Using a Phase Equalizer with Time-Reversal Structure", having an alleged publication date of April 1992 (hereinafter "Ariyavisitakul"). Applicants respectfully traverse this rejection.

Ariyavisitakul discloses an equalization technique using a phase equalizer with time-reversal structure. (See Ariyavisitakul, title and pages 589, 594-595.) Specifically, this reference teaches a "joint estimation." This is performed by a joint estimator shown as part of Fig. 6 of this reference. Ariyavisitakul states (see page 595) (emphasis in the original):

The joint estimator shown as part of Fig. 6 performs *the most important function* in the detection process; it jointly performs equalizer training, timing estimation, and selection of the time-forward/reversal operation mode. The joint estimation algorithm below is based on the use of a training sequence included in each TDMA burst.

Timing estimation includes the estimation of burst timing and symbol timing.

The Examiner's attention is directed to the fact that Ariyavisitakul fails to disclose a method or device for communicating, comprising a forward-time delay value based on the communication channels and a common composite matrix. This reference also fails to disclose a time-reverse device based on the received communication signal and the common composite matrix as positively claimed in

Applicants' independent claims. Specifically, Applicants' independent claims 1 and 11 are shown below (emphasis added):

1. (Original) A method for communicating, comprising:
  - characterizing a set of two or more communication channels;
  - determining a forward-time delay value based on the communication channels and based on a common composite matrix;
  - determining a time-reverse delay value based on the received communication signal and based on the common composite matrix;
  - selecting one of the forward-time delay value and the time-reverse delay value; and
  - equalizing a received signal based on the selected delay value.
11. (Original) A communication device, comprising:
  - a channel estimation device that characterizes a set of two or more communication channels;
  - a forward-time device that determines a set of one or more forward-time delays based on the set of communication channels and a common composite matrix;
  - a time-reverse device that determines a set of one or more time-reverse delays based on the set of communication channels and the common composite matrix; and
  - a selector that selects one of the one of the set of forward-time delays and the set of time-reverse delays to produce a set of selected delays.

Aspects of Applicants' claimed invention teach a novel method and device for performing timing recovery techniques in wireless systems. Specifically, aspects of the present invention include the claimed feature of using "a composite matrix  $\Phi$ " for determining both the optimum forward-time delay as well as the time-reverse delay.

As disclosed in the specification (see pages 10-12) (emphasis added):

As shown by Eqs. (16) - (30), both forward-time and time-reverse delays can be derived using the same composite matrix  $\Phi$ . By using a composite matrix  $\Phi$ , the processing power and time required to derive forward-time and time-reverse delays and their MMSE values is greatly reduced as compared to systems that did not share such common resources.

Thus, aspects of the claimed invention include this novel feature of a common composite matrix, used to determine the forward-time delay value as well as the

time-reverse delay value, which reduces processing time power and time in determining both delays. Also, the MMSE value is reduced as compared to prior art systems.

The Examiner states that "it would have been obvious to one skilled in the art to perform both forward-time delay value determination and a time-reverse delay value determination that will result in optimum timing and selecting a better one, in the convention [sic] receiver described above, for the purpose of maximize [sic] its compensation capability of the equalizer . . .". However, Ariyavisitakul fails to teach or suggest at least the common composite matrix and the use of it to determine the forward-time delay value and the time-reverse delay value. This novel approach is completely absent in the cited reference. Thus, Ariyavisitakul fails to disclose each and every element of the claimed invention and therefore fails as a primary reference in this obviousness rejection.

In addition to the above, Fig. 6 of Ariyavisitakul discloses solely a time-reversal operation. This reference teaches away from the presently claimed invention in that the Ariyavisitakul reference states "the receiver must be able to decide whether to operate in a time-forward or time-reversal mode." (Emphasis added.) (See Ariyavisitakul page 595.) Furthermore, under the joint estimation discussion, again the selection is made to operate in either the time-forward or time-reversal operation mode. There is absolutely no mention of a common composite matrix.

Furthermore, the significant gap left by Ariyavisitakul as discussed above is not bridged by the combination of Ariyavisitakul with the alleged "prior art." As discussed above, Applicants submit that Figures 1-3 do not illustrate a "prior art" communication system, model or signal. Thus, combining Ariyavisitakul with Figures 1-3 is not permissible. Furthermore, assuming, *arguendo*, combining Ariyavisitakul with Figures 1-3 is a permissible combination, which Applicants do not concede, the combination does not yield the claimed invention. Accordingly, a *prima facie* case of obviousness has not been made.

In rejecting claims under 35 U.S.C. §103, it is incumbent upon the Examiner to establish a factual basis to support the legal conclusion of obviousness. See In re Fine, 837 F.2d 1071, 1073, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). In so doing, the Examiner is expected to make the factual determinations set forth in Graham v. John Deere Co., 383 U.S. 1, 17, 148 USPQ 459, 467 (1966), and to provide a reason why one having ordinary skill in the pertinent art would have been led to modify the prior art or to combine prior art references to arrive at the claimed invention. Such reason must stem from some teaching, suggestion or implication in the prior art as a whole or knowledge generally available to one having ordinary skill in the art. Uniroyal, Inc. v. Rudkin-Wiley Corp., 837 F.2d 1044, 1051, 5 USPQ2d 1434, 1438 (Fed. Cir.), cert. denied, 488 U.S. 825 (1988); Ashland Oil, Inc. v. Delta Resins & Refractories, Inc., 776 F.2d 281 293, 227 USPQ 657, 664 (Fed. Cir. 1985), cert. Denied, 475 U.S. 1017 (1986); ACS Hosp. Sys., Inc. v. Montefiore Hosp. 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984). These showings by the Examiner are an essential part of complying with the burden of presenting a prima facie case of obviousness. Note In re Oetiker, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992).

Thus, Applicants respectfully submit the Examiner has not established a *prima facie* case of obviousness. Accordingly, Applicants' independent claims 1 and 11 are not made obvious by the teaching of Ariyavisitakul in view of the Examiner's assertion regarding Figures. 1-3.

Furthermore, claims 2-10 and 12-20, which depend either directly or indirectly from independent claims 1 and 11, respectively, and recite additional limitations are also not made obvious by the alleged "prior art" in view of the teaching of Ariyavisitakul. Thus, claims 1, 11, and their respective dependent claims, are allowable.

In conclusion, the references cited by the Examiner, alone or in combination, do not teach, show, or suggest the present invention as claimed.

#### Conclusion

Thus, Applicants submit all pending claims fully satisfy the requirements of 35

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U.S.C. §103. Consequently, Applicants believe all these claims are presently in condition for allowance. Accordingly, both reconsideration of this application and its swift passage to issue are earnestly solicited.

If, however, the Examiner believes there are any unresolved issues requiring the issuance of a final action in any of the claims now pending in the application, it is requested that the Examiner telephone Mr. Kin-Wah Tong, Esq. at (732) 530-9404 so appropriate arrangements can be made for resolving such issues as expeditiously as possible.

Respectfully submitted,

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